

In The Drawings

A replacement drawings for Figs. 3, 4 and 5 (3 sheets) are attached to replace the originally filed Figs. 3-5. To make the Figures larger they have been spread out over an extra page.

These figures have been formalized, but no substantive changes have been made to the drawings.

REMARKS

Claims 1, 3-9, 11, 24, 28, 32 and 34-40 are pending. By the forgoing amendment, claims 3, 9, 32, 40 and 41 have been amended. Claims 42-48 have been added. Support for the added claims can be found at page 11, lines 20-21 (claim 42); page 9, line 9 through page 10, line 24 (claims 43-48); and elsewhere in the specification.

In the Drawings

Replacement figures have been submitted as requested.

Rejections Under 35 U.S.C. §112, Second Paragraph

As suggested by the Examiner, claim 3 has been amended to recite “is attached to.” The claim is not prolix because it specifies that the system includes a tethered catalyst, not merely a tethered chiral auxiliary.

A “porous insert” is discussed on page 11 of the specification. It can be inserted into (or removed from) a microchannel in a single piece.

Claim 6 has been amended as suggested.

Claim 9 has been amended as suggested. Claim 7 need not be amended because it refers to “a” solid support; this claim can be clearly understood and would not be clarified by adding an indefinite article before each element of the Markush group.

The surface oxygen in claim 8 does not lack antecedent basis.

Claim 32 is amended as suggested. A dendritic catalyst is described at page 10, lines 25-31.

An iron-based alloy is discussed at page 7, lines 21-24. It refers to the structural material of the microchannel reactor.

The second claim 36 has been renumbered as claim 41.

In claim 40, the term "R" is well known to skilled persons in the art as referring to an alkyl group.

Rejection Under 35 U.S.C. §103(a) As Being Obvious Over Dai in View of Greenway

Claims 1, 5, 7-9, 24 and 28 have been rejected as obvious over Dai, U.S. Pat. No. 6,251,280 in view of Greenway "Sensors and Actuators B, vol. 63, pp. 153-158 (2000). This rejection is respectfully traversed.

Dai discloses mesoporous sorbent materials that allow for selective binding of a template molecule. The uses for this system are described at col. 6, line 33 – col. 8, line 18. All of these uses are for sorbents.

Greenway discloses a microreactor using a Pd on silica catalyst.

A "chiral auxiliary" is defined on page 6, lines 24-25 of applicants' specification: "A "chiral auxiliary" is an asymmetric molecule which biases a reaction to favor selective formation of one stereoisomer over another."

The claimed invention is patentable over the combination of Dai and Greenway on two grounds. First, neither reference suggests a chiral auxiliary in a reaction. Therefore, there is no

suggestion to modify Greenway to include a chiral auxiliary. Second, the motivation in the Office Action, “the expected benefit of greater control of spatial and temporal conditions including thermal control” is irrelevant to the disclosure of Dai since neither Dai nor Greenway suggests a need for better thermal control of Dai’s sorbents. Accordingly, withdrawal of this rejection is respectfully requested.

Rejection Under 35 U.S.C. §103(a) As Being Obvious Over Gyraznov in View of Greenway

Claims 1, 3, 5, 7-9, 24, 32, 34, 39 and 40 have been rejected as obvious over Gyraznov, U.S. Pat. No. 4,394,294 in view of Greenway “Sensors and Actuators B, vol. 63, pp. 153-158 (2000). This rejection is respectfully traversed.

Gyraznov teaches a membrane catalyst made by disposing a polyorganosiloxane on a sintered powder metal substrate. The resulting sheet has a thickness of from 0.1 to 1.0 mm.

First, the combination of Gyraznov and Greenway does not create a *prima facie* case of obviousness because the cited references do not suggest any way in which Gyraznov’s relatively large membrane structure could be mounted within the microchannel of Greenway. Nor is there any disclosure of how Gyraznov’s membrane could be oriented within a microchannel. Could Greenway’s device withstand sintering? Even if it could, would the subsequent steps of adding a polyorganosiloxane within the microchannel lead to clogging the microchannel? Alternatively, how could the Gyraznov’s preformed membrane be inserted and oriented within a microchannel? Neither reference suggests such a complex procedure. Accordingly, there is not a *prima facie* case of obviousness for combining these references.

Even if claims 1, 3, 5, 7-9, 24, 32, 34, 39 and 40 were *prima facie* obvious, they are all still patentable in view of Applicant's showing of unexpected results. The Examples section of the present specification shows multiple examples of unexpected results achieved by the present invention. For example, in the case of the Knoevenagel Reaction, with a tethered catalyst in a microchannel, applicants observed superior results over both a conventional fixed bed reactor as well as a microreactor with a conventional catalyst. These superior results over both a conventional reactor and a microreactor using a conventional catalyst are surprising over the prior art. In the case of the Heck Reaction, with a tethered catalyst in a microchannel, applicants observed a 17.1% conversion after 3 hours residence time – when the same reaction was carried out over a tethered catalyst in a batch reactor, the reaction was much slower. This improvement in reaction speed is not suggested in the prior art. Similarly, in the case of the Michael Reaction, with a tethered catalyst in a microchannel, applicants observed surprisingly high yields with short residence times. As the Examiner is aware, a showing of unexpected and superior results establishes patentability of the claimed invention. See MPEP 716.02. Accordingly, withdrawal of the section 103 rejection is respectfully requested.

Claim 3 is additionally patentable because the cited references do not teach or suggest a tethered catalyst attached to a microchannel wall that defines a bulk flow path through a microchannel. Likewise, claim 24 is additionally patentable because the combination of Gyraznov and Greenway does not suggest a coating on a wall of microchannel.

Claim 32 is additionally patentable because the cited references do not suggest a dendritic catalyst.

Rejection Under 35 U.S.C. §103(a) As Being Obvious Over Gyraznov in View of Greenway and
Further in View of Gavriilidis

Claims 1, 3, 5, 7-9, 24, 32, 34, 39 and 40 have been rejected as obvious over Gyraznov, U.S. Pat. No. 4,394,294 in view of Greenway "Sensors and Actuators B, vol. 63, pp. 153-158 (2000) and further in view of Gavriilidis. This rejection is respectfully traversed for the reasons set forth above with respect to Gyraznov and Greenway.

Conclusion

If the Examiner has any questions or would like to speak to Applicants' representative, the Examiner is encouraged to call Applicants' attorney at the number provided below.

Respectfully submitted,

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